Online Parking System: Go-Park

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Abstract - In today's world travelling by private vehicles has drastically increased. Wherever we travel first thing we require after reaching our destination is a parking space for our vehicle. But it is very difficult to find a parking space in any metropolitan city today, particularly during peak hours. On any given day you will find that parking spaces in a city are preoccupied, this leaves the user with no option but to search for parking lots which leads to increase in existing traffic. Today, there is no feasible system that lets you pre-book parking lots. Therefore, in this paper we have proposed an Online Parking System called Go-Park. This system relieves the user from the hassle of manually searching and waiting for empty slots to park the vehicle & offers full automation of paying for parking. User Location is acquired using GPS which helps to display parking lots near the user. The system allows reserving the parking spot in advance, which helps in reduction of time in searching the parking spot, reduction in traffic congestion, reduction in frustration of drivers etc. The payment modules include an option for cashless payment as well which makes it convenient for the user.

Keywords —advance booking, automation, payment module, Go-Park, GPS, Navigation.

I. INTRODUCTION

Every Vehicle needs a parking spot at its destination, so parking facility is an important component of the roadway system. Parking is one of the first experiences that people have when travelling to a destination. Searching for parking spots can take a lot of user's time and energy. As the searching time increases traffic on road is bound to increase with multiple users searching for parking spaces. The increasing number of vehicles on the road along with the mismanagement of available parking space leads to the parking related problems as well as increased traffic congestion in urban areas. One of the main reasons of ongoing parking crisis is due to unawareness of the existing parking lots in a city.

Go-Park is an app based online parking booking system designed to counter the ongoing parking crisis in metropolitan cities. It is a centralized system that will allow user to select an available parking slot from anywhere according to user's convenience. The app will provide information about parking lots available in the city and real time status of the parking slots in the parking lots. Navigation to the parking lots will be provided as well. Payment process will include cashless payment module. The user only has to pay for the amount of time he's parking and not for a predefined time therefore it is beneficial to the user, although user will have to pay a token fee so that people do not misuse the pre-booking system by booking but not showing up to the parking lot. Token fee will be refundable if cancelled within 5 minutes before booking time. The ticket generated will be in the form of QR code which will be scanned to give the user access to the parking lots.

II. LITERATURE SURVEY

An android mobile application named "Park Me" exists, that helps the user analyze area's where parking is available and number of slots free in that area. The app also provides pre-book facility to the users, so it relieves the user from the hassle of manually searching and waiting for empty slots to park the vehicle. For server-side processing, SQL server & php was used, the limitation of the project was that it cannot be used in closed parking areas due to low wavelength [1].

The optimization algorithm "Nearest Neighbor Search" was used for finding parking locations that are nearest to the client's current location. Nearest neighbor search (NNS), also known as proximity search, similarity search or closest point search, is an optimization problem for finding closest (or most similar) points [2].

WSN (Wireless Sensor Network), Infrared (IR) sensor nodes were used to sense the status of the car space and transfers the information to a controller. It thereby displays the information on a LED screen with which the user can check for empty vehicle slots, in turn reducing his time. For prioritizing FCFS algorithm was used [3].

A navigation & reservation based smart parking platform was created using RESTful java & Google cloud messaging. The evaluation of shared reservations and instant reservations provided a dynamic structure for the real time using of parking spaces. Dijkstra optimization

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algorithm was used to obtain the optimal parking route [4].

An Android Application for Smart Parking with Efficient Space Management was developed that offers full automation of paying for parking. The booked vehicles were verified through their number plates using camera & by checking if the registered number is in the server, the Gate opens automatically [5]

Smart parking system with pre & post reservation, billing and traffic app was built. System was based upon RFID tag or card, IR sensor & mobile internet. The system provided following features: Reservation, Cashless Billing, Authentication/hacking intimation, Reservation for post trip, Updates to traffic police [6].

A real-time reservation service in smart parking system was proposed. A rolling-horizon framework is proposed to "roll" the system forwards during a whole operational time. At each decision time point, a mixed integer programming model is formulated to efficiently allocate slots and schedule drivers' travel plans based on current demand and supply. The optimization objective of the model is to minimize total travel cost of all drivers in the system, which reflects the social welfare [7].

With the help of GPS technology, A system was made to guide the drivers to parking location as well as provide real time status availability of the slots. This approach helped in reducing fuel wastage & time while searching for the same. The system facilitates booking too, eventually this helps in smooth traffic flow [8].

A prototype of an E-parking system that provides novel parking management solution for various parking facility areas throughout the city was proposed. The proposed E-parking system enables the drivers to obtain information on availability of parking space and to reserve some parking lot via a suitable GUI that means reservation-based parking management facility. This proposed system can easily detect vehicles improper parking within the parking lot and estimate the duration of the parking lots occupancy by some vehicle by using an integrated component called parking meter that is deployed at each parking lot. The proposed system also enables the automatic collection of parking charges by providing smart payment options to the driver [9].

The ability of a system to perform notification to the users was checked. A research was conducted on cloud notification reliability of parking lots. The test consisted of: Upon a successful parking slot reservation, user must be notified In several events: first, for the users who entering their grace period of cancelation; second, for the user who will enter the Parking lot; third, reminder for the user who will end the parking, They may extend the period of parking, or the must leave at the end of the parking period; forth, thanks notification and wrap-up bill [10]

III. IMPLEMENTATION & METHODOLOGY

A. PROPOSED SYSTEM

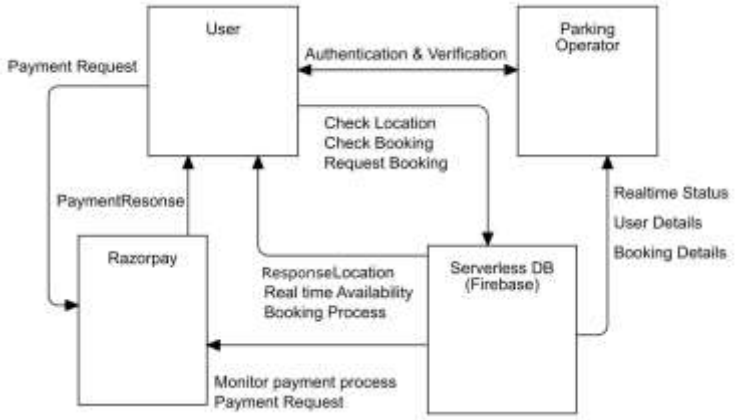

Figure 1: System Architecture

Fig.1 shows four components in the system architecture that are User, Parking Operator, Serverless DB(Firebase), Razorpay.

- **User** component is application through which the user can books parking slots. This component's main task is to communicate with different components to acquire various resources required for the functioning of the system.
- **Serverless DB(Firebase)** is the Database of the system. Its function is to provide various resources to user as requested. This database is a Realtime database and it provides most recent status of all the parking slots.
- **Razorpay** is a converged payments solution that allows businesses to accept, process, and disburse payments via its product suite. With Razorpay, access to all payment modes, including credit and debit cards, UPI, and popular mobile wallets is available.
- **Parking Operator** is a physical person present at the parking lot who sees over the smooth functioning of entry and exit stages as well as authentication and verification stages.

B. PROCESS FLOW

As the user starts the application, permission to obtain user location pops up on the map. After the user location is obtained parking lots near his location are displayed. The user can select any lot on his vicinity. Once the lot is selected, user can check the price and set the time to reserve the slot. Now a token payment is taken from the user to ensure people don't misuse the pre-booking feature. After the token payment is completed QR ticket is provided to the user. If slots aren't available in the user selected lot he is redirected to other lots in vicinity. After payment is completed navigation to the parking lot is provided to the user. Entry is granted after verification of the user using QR code. As the user checks out his parking time is noted and fare is calculated accordingly. After the user pays the fare,

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he can check out by scanning his QR code. The status of the parking slot will be available as soon as user checks out.

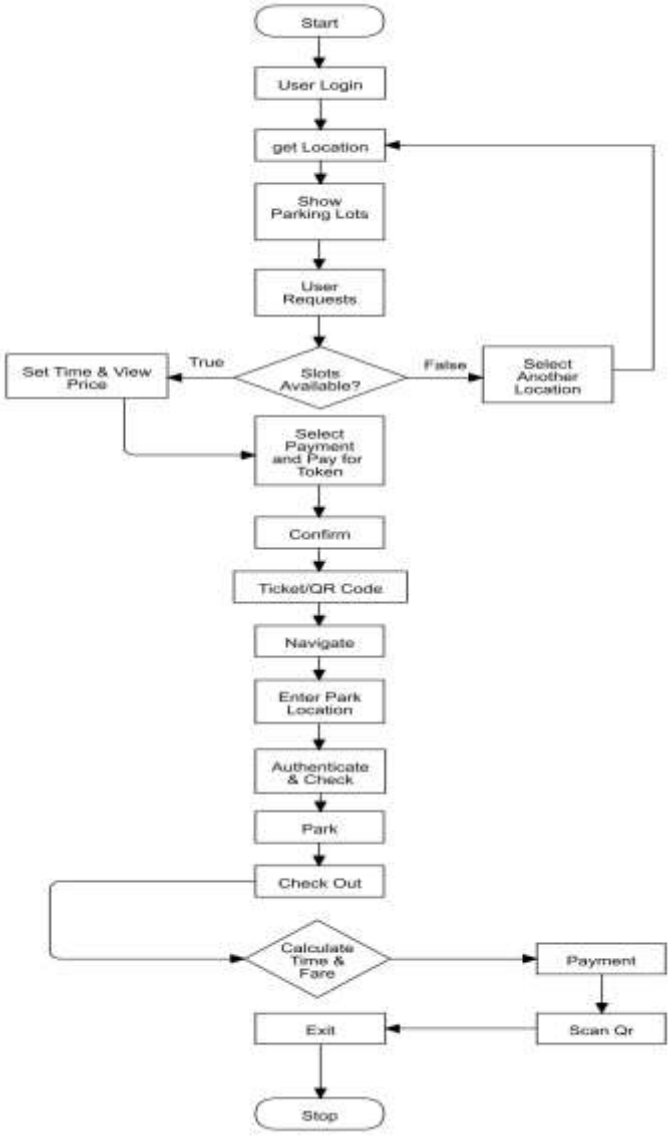

Figure 2: Process Flow

C. ALGORITHM USED

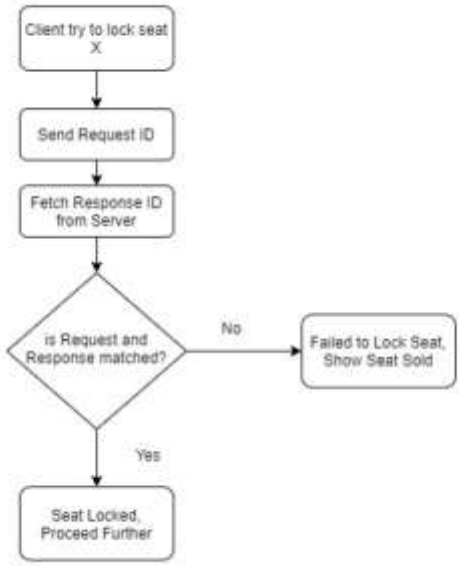

Figure 3: Lookback Algorithm

Concurrent users (clients) try to lock a seat (i.e. the request made to try to update the value of a variable, which stores one valid ID at any instance), then every client app checks this variable to see if their request id matches with the variable value. The lock request is processed by the client whose request ID matches with the variable value and all other clients process request failed message at their side. The client who is able to successfully lock the slot, sets the status of slot to reserved state & proceeds with the booking process.

D. TECHNOLOGIES USED

- **Android Studio:** Android Studio is the official integrated development environment for Google's Android operating system, built on JetBrains' IntelliJ IDEA software and designed specifically for Android development. It is available for download on Windows, macOS and Linux based operating systems. Android Studio has been used to develop the main android application to be used by the user
- **Google Map API:** The Google Maps API allow for the embedding of Google Maps onto web pages of outside developers, using a simple JavaScript interface or a Flash interface. It is designed to work on both mobile devices as well as traditional desktop browser applications. Google Map API is used for identifying lots near user location and navigation.
- **Firebase:** Firebase is Google's mobile platform that helps you quickly develop high-quality apps. Firebase is a mobile and web application development platform developed by Firebase, Inc. in 2011, then acquired by Google in 2014. As of October 2018, the Firebase platform has 18 products, which are used by 1.5 million apps. Firebase provides a real-time database and backend as a service. The service provides application developers an API that allows application data to be synchronized across clients and stored on Firebase's cloud. Firebase is used as a database because it's a Realtime database.
- **Razorpay**: Razorpay is the only converged payments solution company in India that allows your business to accept, process, and disburse payments via its product suite. With Razorpay, you have access to all payment modes, including credit and debit cards, UPI, and popular mobile wallets.

IV. RESULT

These are the modules developed by our group

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Figure 4: Login Page

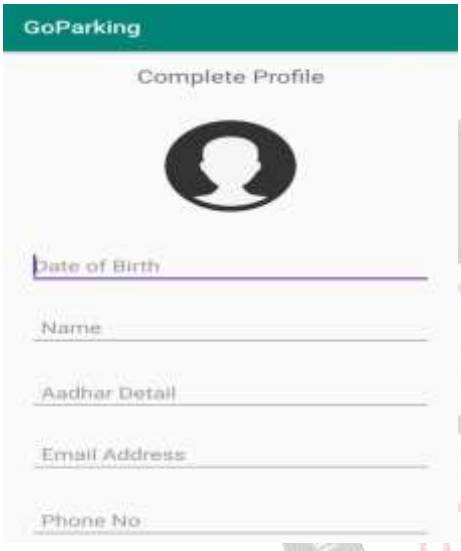

Fig.5 Profile Page

Fig.6 App asking user permission

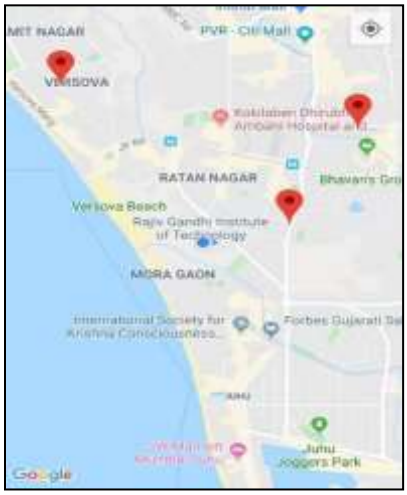

Fig.7 Map Module

Fig.8.1 Slot Layout

Fig.8.2 Slot Booking

Fig.8.3 Slot Confirmation and Token Price

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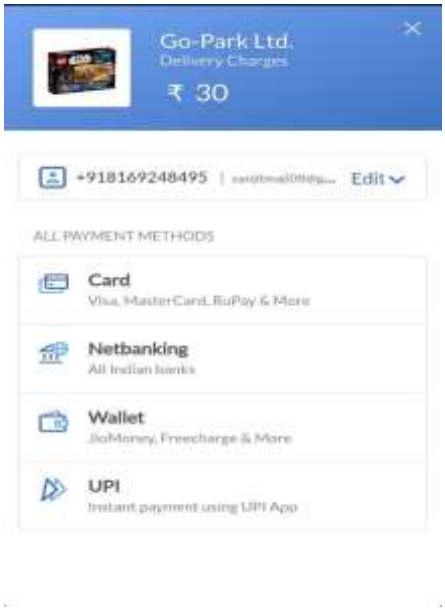

Fig.9 Payment Module (Razorpay)

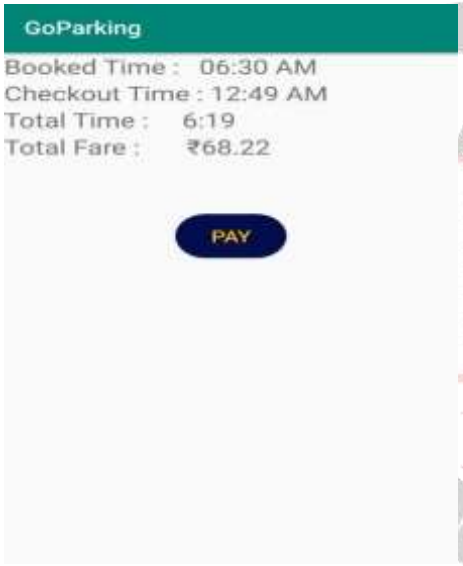

Fig.10.1 Final Fare

Fig.10.2 Final Payment

Fig.11 Navigation

V. FUTURE SCOPE

The idea of online parking booking may still be new to the people at this time but once people understand its benefits there is whole industry waiting to emerge. In future we can have centralized parking lots in the whole city that can be controlled by a committee/government or we can have commercial parking lots developed throughout city owned by different organizations. There can be several companies that will provide online booking of parking that will lead to competition and more competition will lead to better customer service. An industry like this will also create more jobs for multiple types of people, as creation of such system will require people with different skillsets ranging from a menial laborer for development and maintenance of parking lots to a software developer for development and maintenance of the system to a marketing representative to woo the customers.

VI. CONCLUSION

An application like Go-Park has potential to tackle the parking crisis. The app will help user to save time looking for parking slots & user will be able to book the slot from anywhere according to his convenience. Also, the user will not be prompted to pay full amount beforehand and will only require to pay a token amount which will be refundable in case of cancellation. The status of the parking slots will be real time so the data seen by the user will be accurate so that users time is not wasted. As the fare will be calculated according to the time the slot is used and not based on pre-defined time slots this will save users money. While pre-booking parking slots is the primary goal of the application, this application is also useful in creating awareness about the existing parking lots in the area. Information about existing slots will lead to efficient usage of all the available parking slots that will in turn help reduce traffic on the streets. The application will not only save users time and energy, it will also help curb illegal

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parking that will help law enforcement agencies as well. Less time to search parking slots will lead to less traffic on the streets that will in turn help in minimizing pollution.

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